PHOTOELECTRON IMAGING OF $TaBO^-$: OBSERVATION OF A BORONYL TRANSITION METAL COMPLEX

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Boronyl (BO) is isoelectronic with CN, but its chemistry is much less known. One cause for the difficulty of the synthesis of boronyl complexes is that BO does not participate in π-backbonding with the d orbitals of transition metals due to an increased energy of the π^* orbital relative to CN or CO. Here we report a velocity map imaging study on $TaBO^-$, the first observation of a BO ligand with an early transition metal. We observe transitions from the anion ground state ($^4\Delta$) to two neutral states ($^5\Delta$ and $^3\Delta$). We analyzed the chemical bonding in TaBO and compared it with TaCO. We found that there is a comparable amount of overlap between the d_{xz} and d_{yz} orbitals with the π^* orbitals of BO and CO. Our result suggests Ta may be better suited to bond with BO ligands to allow new transition metal boronyl complexes.